Chapter 9

Munitions Storage Procedures

The purpose of field storage in combat and SASO environments is to provide safe munitions storage for tactical units. This chapter contains information on types of munitions storage areas. Also, it discusses planning for and storing of munitions during combat and SASO, with emphasis on meeting safety and storage criteria to the maximum extent possible.

OVERVIEW

9-1. Peacetime explosive standards in DA Pam 385-64 must be followed if possible. However, peacetime standards may not be fully met or maintained because threat level, mission, mobility requirements, and physical condition of facilities vary greatly among theaters of operation. Even with variability in conditions, munitions can be satisfactorily and safely stored in the theater. Regardless of conditions in the theater of operations, a single, basic tenet must be followed; that is, *take all measures possible to minimize risk to personnel, materiel, facilities, and stocks.*

AMMUNITION STORAGE ACTIVITIES

9-2. Unlike permanent ammunition storage areas, munitions assets in a tactical ASA are most often stored on the ground and on unimproved surfaces. Munitions are placed in storage compatibility categories separated from each other by the minimum Q-D. This is based on NEW; NEQ; or total gross tonnage per individual storage unit, depending on the storage system selected. Munitions are likely to be stored in one of four types of field storage areas: TSA, CSA, ASP, or ATP. The different types of tactical ASA compatibility categories, Q-D standards, storage systems, and storage planning procedures are discussed later in this chapter.

THEATER STORAGE AREA

9-3. The TSA is located within the COMMZ in the theater's rear AO. The modular ammunition company's HLPs generally operate the TSA. These platoons may receive added support from MLPs. The TSA is usually the largest ASA in the TO. Its mission is to receive, store, and ship containerized and break-bulk munitions. It also issues, inspects, configures, manages and maintains theater reserve munitions. The TSA also provides area ammunition support to units operating in the COMMZ.

9-4. To facilitate shipment, TSAs are located where there is direct access to airfields, railheads, ports, road networks, and facilities. If this is not feasible, the TSA should be located within a short line-haul distance of such facilities. The TSA can be either a fixed, semifixed, or open outdoor storage area, or a combination of these.

9-5. In peacetime, the TSA may be a permanent storage facility (e.g., igloo, magazine, bunker, or other fixed or semifixed explosives storage building). Unless the TO has existing fixed explosives storage facilities, the TSA is usually an open outdoor storage area in SASO/wartime.

9-6. The area selected for the TSA should have as much hard surface as possible. Also, it must have adequate drainage and a road network capable of supporting heavy vehicle traffic. It should be designed to move break-bulk and containerized munitions onto and off of railcars, line-haul vehicles, and PLS. Other logistical units (i.e., transportation and terminal support) may be available to assist munitions units in conducting railhead and other transload operations.

9-7. A TSA may expand to about 40 square kilometers to meet its stockage objective (see Table 9-1). If the stockage objective exceeds 25,000 STs, a second TSA should be established. The ASCC and METT-TC determine the stockage objective of TSAs. The TSA receives 100 percent of its stockage objective from the POD.

Table 9-1. ASA Types

ASA	Days of Supply	Stockage Objective
TSA	30 Days	25,000 STs
CSA	7 Days	25,000 STs
ASP	3 Days	NA

9-8. Munitions arrive at the TSA on theater transportation assets. They are usually containerized but may include break-bulk or a combination of both. Because a high percentage of TSA receipts are containerized, munitions and transportation personnel must manage containers to guarantee accountability and to retrograde them for reuse. See FM 9-6 for a discussion of the flow of munitions in the theater of operations.

CORPS STORAGE AREA

9-9. The CSA is located in the corps rear AO. The modular ammunition company's MLPs generally operate the CSA. If the CSA is receiving containerized munitions, HLPs may support the MLPs. The CSA mission is to receive, store, issue, inspect, configure, manage, and maintain the corps reserve munitions stocks.

9-10. The CSA supports the munitions requirements of all assigned or attached corps units. It is also the primary source for the division's munitions. It stocks 10 to 15 DOS to meet initial combat requirements; thereafter, it maintains about 7 DOS. At least one CSA is required to support ASP and ATP operations for each committed division. The CSA may be fixed, semi-fixed, or open storage depending on the tactical situation. It is more fixed than the forward storage areas it supports. Usually in SASO or wartime environments, it consists of open storage.

9-11. The CSA should be located near MSRs and railheads to allow easy access for theater and corps transportation assets. The site must have an improved road that can handle heavy vehicle traffic.

9-12. The CSA receives about 50 percent of its munitions from the POD and 50 percent from the TSA. These munitions may be in either break-bulk or containerized loads. Munitions shipped from the CSA to an ASP may be in single-DODIC, break-bulk, or configured loads. Munitions shipped from the CSA to the ATPs are in MCLs.

9-13. The CSA can expand to about 40 square kilometers. When the stockage objective reaches 25,000 STs, a second CSA should be established. The COSCOM establishes the CSA stockage objective, which is based on projected theater combat rates and METT-TC.

9-14. The COSCOM ordnance/corps support battalion analyzes workload requirements and synchronizes operations with corps transportation assets. See FM 9-6 for a discussion of the flow of munitions in the theater of operations.

AMMUNITION SUPPLY POINT

9-15. The ASP is another source of munitions for the division. It is located in the division's rear AO. The modular ammunition company's MLPs operate the ASP. The ASP provides munitions support to corps and nondivisional units in the division's AO.

9-16. The ASP normally stores 3 DOS to meet routine, surge, and emergency requirements of supported units. Tactical plans, availability of munitions, and the threat to resupply operations are the basis for stockage levels.

9-17. ASPs should be considered as temporary, open storage sites. ASPs are located near MSRs and rails (if feasible) to allow easy access for theater and corps transportation assets. It is essential that ASPs have good road networks that can support heavy vehicle traffic. Thus, commanders will focus on locations that minimize the need for engineer support. The ASP receives 100 percent of its munitions shipments from the CSA on flatracks in single, mixed DODIC, or configured loads.

AMMUNITION TRANSFER POINT

9-18. The ATP is a temporary site from which munitions are transferred from corps transportation assets to the organic vehicles of the big six combat units (i.e., armor, aviation, infantry, artillery, air defense artillery, and combat engineers.) The DAO controls all division ATPs.

9-19. Each maneuver brigade has an FSB that operates an ATP in the BSA. The ammunition sections of the following units operate the ATPs:

- Supply company, FSB in a heavy or light division.
- S&T company, support battalion in a separate brigade.

They support all units in the brigade support sector and receive mission guidance from the DAO. Their mission is critical since they logistically support the maneuver commander's tactical plan to ensure that munitions are available for combat.

9-20. The MLP (ATP section) of the modular ammunition company operates an ATP located in the DSA of the division AO. It supports corps, divisional, and nondivisional units operating within the division support AO. The DAO provides mission guidance to the ATP and establishes its priorities.

9-21. Using either unit vehicles with MHE (e.g., HEMTT), PLS, or organic ATP MHE, munitions are transferred from corps trailers or PLS flatracks to vehicles organic to the using unit. Departing empty tractors/PLS vehicles backhaul the empty trailers and flatracks. Corps transportation should always drop a trailer or flatrack and take one in return. This practice is called *one-for-one exchange* and also applies to using units, tactical situation permitting. Without this exchange, a shortage of trailers and flatracks occurs that may critically impact resupply of munitions. S&P trailers or flatracks are also used for retrograde of unserviceable munitions and CEA. Also, these vehicles may transport fatalities and POWs, if necessary. See FM 55-10 for more information.

9-22. Shipments from the CSA and ASP together make up 100 percent of the ATP stockage level. About 75 percent of the ATP munitions requirements are throughput from the CSA in MCLs. The other 25 percent are received from the supporting ASP in single, mixed DODIC, or configured loads.

9-23. The ATP is located near an MSR or adequate road network to provide access for corps transportation assets and combat user vehicles. The ATP must be on firm ground with good drainage and offer easy access for vehicles. Also, it must allow for easy recovery of pallets, S&P trailers, and PLS flatracks.

9-24. The site must be large enough to allow MHE to maneuver. Flatracks and trailers must be placed so the MHE has adequate space to transfer munitions. As with any other tactical site, good cover and concealment are extremely important. See Chapter 4 of this manual for a complete description of ATP organizational structure and munitions operations and procedures.

STORAGE SAFETY PRINCIPLES

9-25. The highest degree of safety in munitions storage will be achieved if each item is stored separately. However, this is not feasible. Observing the following principles will ensure safety of munitions storage regardless of the type of facility:

- Balance safety, environmental, and other factors when storing a mix of munitions. Certain munitions must not be stored together.
- Do not store munitions and explosives with dissimilar materiel or items that present positive hazards to the munitions. Examples include flammable or combustible materiel, acids, or corrosives.
- If compatible, different types of munitions and explosives may be mixed in storage.
- Mix compatible munitions and explosives in storage when such mixing facilitates safe operations and promotes overall storage efficiency.

- Do not store munitions with an assembled initiating device as they present a significant storage risk. Exceptions include–
  - If the device is packaged in a manner that eliminates risk of accidental detonation.
  - If fuzed items are configured/packaged to prevent arming of the item.
  - If safety features prevent accidental initiation or detonation of the item.
- Protect munitions from the elements by providing appropriate dunnage and adequate shelter and ventilation. This practice reduces maintenance and ensures maximum serviceability and shelf life of stocks.
- Place munitions in appropriate SCG or FSC and separate by minimum Q-D as determined by DA Pam 385-64.

COMPATIBILITY

9-26. All munitions and explosives are assigned to an appropriate SCG for storage at Army activities. See Appendix I for more on SCGs.

9-27. During wartime and contingencies, logistical considerations and combat situations may warrant more risk-taking. When warranted, the MACOM commander may authorize relaxation of storage compatibility requirements. The FSCs listed below simplify field storage compatibility while maintaining an appreciable safety level. Compatibility requirements do not apply when storing configured loads in the theater of operation. Another safety element, Q-D classification, further separates munitions and explosives into hazard classes.

FIELD STORAGE CATEGORIES

9-28. For storage in the field, munitions are segregated into primary groups referred to as storage categories. Groupings are based on the desirability to store components of complete rounds in adjacent stacks and consideration of the hazards of propagation of explosion, range of fragments, spread of fires, and chemical contamination.

9-29. Listed below are the FSCs of conventional ammunition. (See DA Pam 385-64 for more information on field storage.)

- *Category A.* Fixed and semifixed artillery munitions, except incendiary and chemical.
- *Category B.* Propelling charges, fuzes, primers, flash reducers, and separate loading artillery projectiles, including HE and AP but not incendiary and chemical projectiles.
- *Category C.* Mortar ammunition and hand grenades, except incendiary and chemical.
- *Category D.* All pyrotechnics and chemical ammunition, including chemical-filled rockets; gas, smoke, and incendiary bombs; gas and smoke artillery ammunition; incendiary and chemical grenades; smoke pots; VX-filled mines; bulk-packed incendiary and small arms tracer cartridges.

- *Category E*. All demolition explosives, antitank and antipersonnel mines (except VX-loaded), and components (i.e., blasting caps, firing devices, detonating cord, and safety fuses).
- *Category F*. Rockets, rocket motors, and rifle grenades, except chemical.
- *Category G*. The following items of USAF Class V supply: all unfuzed HE bombs, aircraft mines, aircraft torpedoes, and fragmentation bombs; fuzes and/or primer-detonators for the above items; fragmentation bomb clusters, fuzed and unfuzed. The remainder of USAF Class V items must be stored in other applicable categories.

QUANTITY-DISTANCE

9-30. Q-D hazard classifications are designed to protect personnel and property in areas adjacent to storage facilities, to limit the quantity of stocks that may be lost in an explosion, and to reduce the possibility of any explosion involving large quantities of explosives and munitions.

9-31. Q-D relationships for specific classes of munitions and explosives are based on levels of risk considered acceptable for that item. During peacetime, the Q-D tables set forth in Chapter 5 of DA Pam 385-64 must be strictly followed unless a waiver is obtained. The tables apply generally to exposures involving nonmilitary personnel, family housing, and health and morale facilities.

9-32. During SASO, contingency, and wartime operations, military requirements may make full compliance with safety regulations difficult. Compliance with Q-D regulations is of great importance to commanders since their purpose is to minimize losses of personnel and stocks and to maintain the full operational capability of facilities. Normal explosives safety criteria, procedures, Q-D separations, and methods of application in DA Pam 385-64 apply except where waivers are granted.

9-33. To meet readiness requirements, certain units may have their ABL uploaded on organic vehicles or stored near the unit in a BLAHA. DA Pam 385-64 defines Q-D requirements. BLAHAs outside and inside the US have different standards, which must meet the Q-D standards of this publication.

9-34. Applicable Q-D terms for field storage safety purposes include the following:

- *Storage subdivisions*. Field storage areas are divided into storage sections and further subdivided into FSUs and stacks to ensure adequate dispersion for operational safety purposes.
- *Dispersion*. If assets are adequately dispersed, the ASP is not an inviting target from the air. When possible, quantities of each type of ammunition should be stored in two or three widely separated sections. If the contents of one section are destroyed, the entire supply of any one item will not be lost. When space is not sufficient to disperse the ammunition, construct earthen barricades to help reduce the hazard.
- *Barricades*. The effect of sympathetic detonation can be reduced using man-made barricades constructed IAW DA Pam 385-64.

- *Interstack distance.* Interstack distance is the minimum distance between the near edge of adjacent stacks. Stacks are required to be separated by minimum distance of 50 feet to inhibit the spread of fire. However, be aware that interstack distances do not always provide protection from propagation of detonation by blast overpressure or missile fragments. Aggressive fire fighting usually helps to prevent the spread of fire from one stack to another at this distance. The greater the distance between stacks, the less likely fire will spread from stack to stack. When possible, separate stacks by a distance greater than that prescribed.
- *Inter-FSU distance.* The inter-FSU distance, which is the distance between the nearest edge of the nearest stacks in adjacent FSUs, can also help prevent the spread of fire (see Table 15-2 of DA Pam 385-64). When these distances cannot be met, use extra care in setting up and maintaining fire protection, fire guards, and firefighting measures.
- *Optimum safety distance.* The optimum safety distance is the limit inside which structural damage from a blast or missile fragments will be serious. Consider this distance if ASAs, ATPs, or BLAHAs have to be located near gasoline or other storage facilities, hospitals, permanent radio transmitters, railroads, and highways.

9-35. Special storage requirements must be met for certain categories of munitions. Safety and environmental considerations make it essential to comply with the following guidelines:

- *Nontoxic Chemical Ammunition.* Store chemical-filled ammunition so that each container, item, or bomb can be inspected and easily removed. Keep projectiles containing phosphorus out of the direct sun and store them bases down. Locate water-filled barrels for immersing leakers within the toxic ammunition site.
- *Toxic Chemical Ammunition.* Store toxic chemical ammunition in the part of the ASP with the lowest elevation and at least 1 mile downwind from inhabited ASP buildings or other storage areas. Make sure no inhabited buildings or storage areas are within 2 miles downwind of the storage site. Also, ensure maximum security for this type area.
- *Rockets.* Safety requirements for storing rockets are stricter than for most other types of conventional munitions. Store small- and large-caliber rockets and large-caliber, free-flight rockets on the outer edge of any storage area. Point the noses away from all other stored munitions and away from all inhabited areas. Locate the rockets so that only their own containers are between the rockets and the barrier. Do not make stacks more than one row deep.
- *Bombs.* Category G ammunition (bombs) is usually stored and issued by the USAF. In emergencies, however, depot and ASP commanders may store bombs. For this reason, it is important to be aware of the following restrictions:
  - The FSU is the smallest storage unit authorized.

- Fuzed fragmentation bombs in the same FSU may not be stored with other bombs.
- Components of bombs (i.e., fins, fuzes, primer-detonators) can be stored between FSUs. If that is done, remember to protect fuzes and primer-detonators from heat and moisture.

SITE SELECTION

9-36. Safety and efficiency must be top priorities when selecting a field storage site. Site selection and layout of an ATP are discussed in Chapter 4 of this manual. It is essential that explosives experts be involved early in this process to preclude possible future disruptive, safety-driven relocations of established Class V facilities.

9-37. A primary and an alternate site should be selected. Alternate sites provide relocation options in case the primary site is unavailable for operational reasons, or if enemy action or the effects of weather on the terrain make evacuation necessary.

9-38. A map and ground reconnaissance of the proposed sites should be made. Reconnaissance ensures that the sites are suitable for performing safe operations and providing efficient support to using units. A map recon provides information on the terrain and the possibility of natural cover and concealment. A ground recon supports the information gathered from the map recon and further reveals terrain features. Also, it reveals other conditions that may have changed or may not be identifiable on a map.

9-39. Based on reconnaissance information, site recommendations are submitted to higher headquarters for approval. The sites selected may not be approved for operational and/or tactical reasons. The selection process may have to be repeated, or higher headquarters may identify an area for the location of the storage area. See Appendix J for information on FARPs.

ASSESSING TACTICAL REQUIREMENTS

9-40. Tactical conditions and METT-TC factors must be reviewed to reduce conflict between the tactical and safety requirements of an ideal site. Often, these requirements are not compatible, and defense risks must be weighed against the operational mission.

9-41. The tactical situation may require that procedures be modified or supplemented. Other tactical considerations are found in FM 71-100 and FM 100-15. The following considerations apply to all storage and supply sites:

- *Transportation.* Sites should be located near the MSR and supported units to allow easy access. The distance to supported units must be reduced in keeping with security constraints.
- *Facilities.* Sites should have ready access to (but be located as far as possible from) hospitals, important military installations, airfields, docks, factories, fuel storage and/or distribution activities, and similar facilities. This is especially true for sites subject to enemy attacks. If chemical munitions are stored, downwind distances to populated areas must be considered.

- *Defense.* Sites should be easy to defend against ground attack using the fewest personnel and materials possible. The site must be large enough to allow for dispersion of stocks to protect against heavy loss by fire or explosion. As with any other tactical site, good cover and concealment are critical.
- *Road network.* In addition to access and exit roads, sites must contain a good internal road network. Roads must easily allow large vehicle passage under all weather conditions and should require as little maintenance as possible. A one-way traffic pattern is preferred to minimize confusion and congestion.
- *Railhead.* Sites with potential for expansion into larger, more permanent sites should have a railhead nearby.
- *Terrain.* Sites will be established on firm, level ground. Drainage patterns and soil conditions must be studied carefully. A level site that does not drain adequately during wet weather may result in unsafe and inefficient operations. The site must provide easy access for using unit vehicles and for recovery of PLS flatracks, pallets, and trailers. Natural barriers at proper intervals are desirable to segregate field FSUs and categories of munitions.
- *Fire safety.* The site must be inspected for fire hazards. A low level of flammable vegetation and an adequate water supply are favorable considerations.

STORAGE SYSTEMS

9-42. Once the site has been selected and approved, the selection of a munitions storage system must be made. Four storage systems may be used for field storage of munitions and explosives:

- Area storage.
- Roadside storage.
- Combination area/roadside storage.
- Modular storage.

9-43. Consider the following factors when choosing a storage system:

- Physical characteristics of the site.
- Location of hostile forces.
- Weather expectations for area.
- Time and resources available.
- Expected life of the site.
- Available space and type of operation that most readily comply with Q-D requirements.
- Freedom of vehicle movement throughout the storage site. Vehicles must be able to pass other vehicles being loaded/unloaded. There should be no dead-end roads that require backing up or turning around.
- Roads should be improved, if possible, to withstand traffic up to fully loaded trailers and PLS trucks.

Area Storage System

9-44. The area storage system is divided into three sections and subdivided into FSUs and stacks. Stacks of munitions are arranged in a checkerboard pattern and spaced according to the Q-D requirements in DA Pam 385-64. This system provides efficient use of the total area, but may require significant road and pad construction and stabilization of earth.

Roadside Storage

9-45. Roadside storage allows munitions to be stored in stacks along the edges of existing roadways. FSUs and sections are spaced according to Q-D requirements in AR 385-64. Effective use of this method requires a larger road network and more total area than the area storage system. However, little construction is necessary.

9-46. A variation of roadside storage, known as *"storage in depth,"* is very useful if the existing road network is limited. With this method, one or more additional stacks of ammunition is stored behind the roadside stack, away from the road. The use of this system is restricted in wet climates or in areas with poor soil conditions or heavy forests. Under those conditions, the stacks of ammunition would be difficult to reach.

Area and Roadside Storage

9-47. A combination of area and roadside storage is often used to lessen the bad aspects of both systems. It allows the most effective use of the existing road network in a limited area. While this combination does not require as much land as roadside storage, it does involve some road and pad construction.

Modular Storage System

9-48. The modular storage system is used for storage of high-explosive bombs and other conventional ammunition. Munitions are stored on pads within earth-barricaded areas called cells. The cells are joined to form modules, which may, in turn, be arranged to form module blocks. See DA Pam 385-64 for modular storage system requirements.

9-49. The modular storage system is used in a combat zone where limited security and inadequate real estate/operational limitations make it impossible to store munitions IAW Q-D and compatibility regulations for area, roadside, or area/roadside storage. It may be the only solution for storing large quantities in rear areas where there is insufficient real estate.

9-50. This system does not provide the same degree of protection for personnel or munitions stocks afforded by regular Q-D dispersion. Before deciding to use the modular system, compare its advantages and disadvantages to those of the other field storage systems as defined in DA Pam 385-64.

9-51. DA Pam 385-64 contains information on where, when, and how to use the modular storage system. Also, it discusses physical and construction characteristics, explosives limitations, barricade requirements, and site selection criteria.

9-52. **Special Guidelines for Modular Storage.** In peacetime, modular storage is limited to HE bombs (fuzed or unfuzed, with or without fins), similarly cased HD 1.1 ammunition (e.g., HE projectiles), and the following contained in nonflammable or metal shipping containers: 30mm and smaller ammunition, cluster bomb units, inert munitions components, and HD 1.4 munitions. By design, modular storage can redirect some of the blast overpressure from an explosion but provides little to no protection against fragment debris or the spread of fire. In a combat zone, there are no restrictions on the type of ammunition authorized for modular storage. In this case, mixing ammunition in modular storage is authorized.

9-53. Certain munitions require special storage consideration when stored in a modular system. Ensure safe storage by complying with the following guidelines:

- All storage and safety considerations will be followed for CS and CN (riot control agents) chemical munitions and WP/PWP ammunition. Cells containing these items must be in a separate module, away from other types of ammunition.
- Chemical munitions (except WP/PWP and CS/CN) and rockets will be stored in end cells of modules. Store rockets and missiles pointing into barricades.
- Blasting caps can be stored in a separate bunker built inside the cell containing all other compatible munitions. Ensure the bunker has adequate side/overhead cover to protect other explosives in the cell.
- Propellant charges must be stored in a separate module. The module may have one or more cells, depending on the required stockage.
- ICM must be stored alone in a separate module. The module may have one or more cells, based on the required stock objective.
- Munitions and CEA awaiting destruction must be stored in a separate module. The module may have one or more cells, based on requirements.

Urban/Built-up Areas

9-54. Structures in urban or built-up areas may also be used to temporarily store or protect munitions. The possibility of setting up an ASA in a village or other built-up area may be realistic and requires consideration when planning wartime operations. With this system, the real estate could be in an existing small city, a village, or a structure in the outlying countryside. The physical configuration layout is based on the safety requirements for munitions storage found in DA Pam 385-64.

STORAGE AREA PLANNING

9-55. After the site has been selected and the system of storage is known, a storage plan and SOPs must be written for the operation. Good planning helps ensure that operations are safe and efficient. The following checklist will be used when developing the storage plan/concept of operations:

- What is the expected maximum tonnage of each SCG?
- What are the expected average daily receipts and issues?

- How much time is available before the first munitions shipment arrives?
- What is the expected lifetime of the storage area?
- Which storage system will be used?
- What physical characteristics of the terrain can be used as natural barricades? What characteristics deny or restrict use of certain areas?
- What natural cover and concealment are available?
- What engineer construction and support are available or necessary?
- What is the total stockage objective for the site?
- What special security requirements are needed for classified and sensitive items based on the CIIC? See the FEDLOG or JHCS for a detailed explanation of CIICs and the CIIC for any munitions item.
- What section, FSU, and stack numbering system are needed to ensure that location and retrieval of stocks are fast and accurate?

GENERAL LAYOUT

9-56. Fundamental rules apply to the layout of all types of munitions supply and storage facilities. General safety procedures must be considered first in any site layout. Basic operating procedures are also very similar. Munitions survivability software is being developed by the Army and should be available in the near future. This software is designed to assist the user in preparing the safest storage plan possible for the designated terrain.

9-57. Key differences between CSA/TSA field sites and ASP/ATP sites are that the CSA and TSA generally have larger, more stable storage areas and better road networks.

9-58. All storage areas should be arranged into separate sections to enhance safety. The arrangement of stocks in each section should make receipt, issue, and inventory/rewarehousing/configuration as easy as possible.

9-59. Each section consists of a number of storage locations or modules, depending on the type of storage system used. Storage locations within each section are separated according to the Q-D requirements in DA Pam 385-64, METT-TC permitting.

9-60. The following guidelines should be observed to maintain efficient operations and prevent units from unnecessary waiting:

- Ensure signs are posted showing traffic direction, entrances, and exits.
- Draw maps of storage areas and provide copies to using units.
- Ensure there is enough dunnage near storage locations.
- Arrange for one-way traffic whenever possible; when not possible, provide turn-around points. Also ensure adequate space for vehicle holding and assembly areas.
- Ensure the use of ground guides is strictly enforced.

TACTICAL LAYOUT

9-61. Layout requirements for each site vary according to the tactical situation, the terrain, the proximity to forward areas, and the type and

amount of materiel handled. A good layout is one that achieves the following:

- Provides for easy, efficient work flow.
- Minimizes movement of munitions, tools, and equipment.
- Permits easy entry and exit for heavy traffic.
- Provides effective control of unit operations.
- Permits defense of the area.

Proper positioning of weapons, construction of defensive works and obstacles, and organization of unit defense and security are other prime considerations.

9-62. A map overlay will be prepared to include the defense plan and operational layout for the new area. If needed, a route overlay will also be prepared. The advance, main, and rear parties use overlays, and copies must be submitted to higher headquarters. When HNS is available, the layout will incorporate coordination of services between US and HNS activities. See Figure 9-1 for a typical ASP layout.

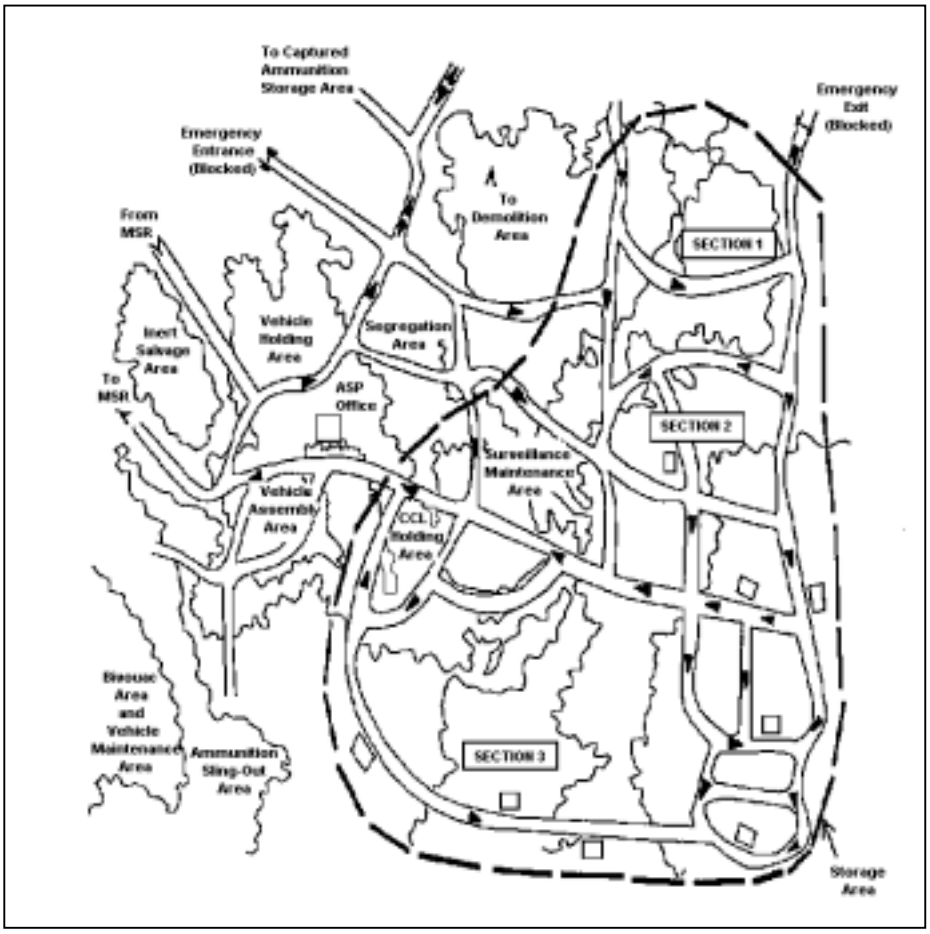

Figure 9-1. Typical ASP Layout Plan

AREA LAYOUT

9-63. The *operations office* is the nerve center of a storage activity. It is normally the control section of an ordnance company or modular platoon. It should be located inside the main entrance where all incoming customers can reach it easily. Also, it should be located near the administrative section but a safe distance from the main ASA. Vehicle holding areas for inbound munitions shipments and vehicle assembly areas for outbound munitions vehicles will be within walking distance. The operations office must have adequate parking for customer and ordnance company vehicles.

9-64. Parking for inbound, ammunition-laden vehicles or unit vehicles scheduled for loading is provided in the *vehicle holding area*. It must have enough maneuver room for large vehicles, and its size must be sufficient to accommodate the largest convoy of vehicles that the site may expect to receive. It is a transit area, and vehicles remain only long enough to be processed for storage or issue.

9-65. The *segregation area* is a temporary storage area for segregating ammunition turn-ins and mixed munitions shipments. It must be located near the salvage area to allow convenient storage or usage of packing materials.

9-66. Nonexplosive munitions, such as munitions residue and salvage materiel, are stored in the *inert salvage area*. It should be located near the segregation area and the surveillance and maintenance area.

9-67. The *demolition area* is set aside for the destruction of unserviceable munitions. A good access road is necessary to facilitate the delivery and unloading of munitions. Because S&P trailers and rough-terrain forklifts may be needed to conduct demolition operations, both the road network and the area must be able to support these vehicles. Land selected for the demolition area will not be used for other purposes. Also, it will have scarce vegetation to minimize the fire hazard. Demolition operations are to be conducted only after munitions disposition instructions have been received from higher headquarters.

9-68. The *vehicle assembly area* provides parking for all outbound vehicles, including empty/loaded ammunition vehicles being assembled into a convoy. The assembly area must be within walking distance of the operations office and meet all requirements of the vehicle holding area.

9-69. Emergency aerial resupply operations are conducted at the *sling-load operations area*. It will be located at least 1,800 feet or 550 meters from munitions storage locations, working areas, and inhabited areas. When planning sling-load operations, the allowable gross weight for cargo aircraft must be considered. See FM 10-450-3, and TM 38-250, for more information on sling load operations.

9-70. The *bivouac area* is the living area for personnel operating the site. It must be located nearby but outside the fragmentation and blast areas. When locating this site, personnel safety distances from the ASA and the physical security of the bivouac area will be the primary considerations.

9-71. Unit vehicles and MHE are maintained in the *maintenance area*. A separate section within this area may be designated for refueling vehicles.

9-72. The *surveillance and maintenance area* is used for performing munitions inspection, repack, and maintenance. For efficiency, it should be located between the operations office and the storage areas.

9-73. Live munitions are stored in the a*mmunition storage area*.

9-74. The *captured enemy ammunition area* is used to store all CEA turned into the storage facility. CEA is always stored separately; once identified and classified, it is stored using the same principles required for storing US munitions.

SPECIAL LAYOUT

9-75. *Munitions stacks* should be positioned far enough off the road to allow trucks to be loaded or unloaded without interfering with traffic. Containers must be stacked so that munitions markings are visible and all containers can be accessed easily. Munitions stacked on an inadequate or unstable foundation may topple or sag. Inspectors should look for settling or shifting stacks so that corrections can be made before damage results. See DA Pam 385-64 for more information.

9-76. Some units use a *standard identification system* to identify and locate munitions. Such systems use lettered or numbered locations that always contain certain types of munitions. For example: Sub-depots are designated by letter; storage sections by number; FSUs by letter; and stacks by number (i.e., munitions may be stored in sub-depot A, section 1, FSU-A, stack 1 [A1A1]).

9-77. Whenever a site is established and similar stocks are required, they are placed in the same relative locations; however, ground features may preclude this. When a standard identification system is used, a major road or prominent landmark may be referenced. If a road or landmark is not available, the system should follow a logical alphabetical or numerical progression as personnel enter and move through a specific section of the site.

9-78. *Lot number separation* divides and stores all munitions by lot number. The manufacturer numbers and identifies munitions by lot. The lot number is vital for accountability, issue, and storage. Ensure individual lots are segregated in each storage location, clearly separated from other lots.

9-79. *Climatic considerations* such as adequate shelter, dunnage, good drainage, and good ventilation are necessary to protect stored munitions. Tarpaulins can be used to protect munitions stacks from the effects of rain and intense sunlight. Tarps must never be placed directly on ammunition; doing this raises the temperature underneath the tarp. Ensure a minimum 18-inch clearance between the tarp and the munitions. Tarps can be used as improvised shelters for VT fuzes and pyrotechnics. Cotton tarpaulins, 16 feet by 16 feet, NSN 8340-00-817-2126, provide both shade and cover.

9-80. In desert and tropical climates, munitions must be shielded from the direct rays of the sun. To minimize exposure to sunlight, position containers

with long axes pointed in an east-west direction. Priority for shade is as follows:

1. Guided missiles and rockets.
2. Propelling charges.
3. Fuzes.
4. Pyrotechnics.
5. Projectiles.

When containers are used for storage, doors may be left open or opened periodically so that air can circulate. Blowing sand should not accumulate around containers or pallets.

9-81. The proper use of *dunnage* increases stack stability. Generally, stacks must be at least 4 to 6 inches off the ground to prevent munitions from getting wet and to ensure adequate circulation. Empty munitions boxes or ration boxes filled with sand or dirt may be used to elevate the stacks if lumber is not available. Dunnage must be checked frequently for rotting and deterioration. See DA Pam 385-64 for more information.

9-82. If *drainage* threatens to be a problem, ditches must be dug around stacks of munitions. If propellant charges are stacked, lids will be turned down slightly so water does not seep in or accumulate.

9-83. *Storage of guided missiles and rockets* requires special care. Guided missile assemblies should be stored in permanent structures because the missile bodies have delicate electronic components that must be protected. If stored in the open, protect the containers with tarps or other suitable cover. In either case, storage areas should have hard, level surfaces, and all humidity indicators must be accessible. Guided missiles and rockets must be stored on the perimeter of any storage location, with all nose ends pointing in the safest direction, normally outward.

9-84. Security is a major concern when handling classified or sensitive missile and rocket components. Classified or sensitive components must not be stored with unclassified components. Guards and access control must be employed if these components are stored in the open. An accurate check must be kept on personnel who enter classified or sensitive storage areas or structures. See AR 190-11 for more detailed security information.

9-85. Natural cover and concealment must be used whenever possible to *camouflage* munitions storage areas. Camouflage requirements may conflict with requirements for firebreaks and munitions shelter. The use of camouflage must be consistent with explosive safety and munitions storage procedures. See FM 20-3 for general information on the use of camouflage.

9-86. MHE is essential to the receipt, storage, issue, and maintenance of munitions. The type of MHE available must be considered when planning operations. Certain MHE may not be suited to the terrain. See FM 9-6 for information on MHE assigned to ordnance units.

UNSERVICEABLE MUNITIONS STORAGE

9-87. Unserviceable munitions are those either manufactured with defects or made unserviceable by improper storage, handling, packaging, or

transportation. Shipments of munitions received from other supply facilities will be inspected for serviceability. Unit turn-ins not inspected at the time of receipt must be stored in a segregated area for later inspection. Ammunition specialists must be trained to recognize indications of unserviceability and report them. Refer to Figure 3-2 of this manual for information on turn-in procedures.

9-88. Inspectors segregate unserviceable munitions from serviceable munitions for safety reasons and to reduce rehandling. The munitions must be segregated by DODIC and lot number, followed by serviceability classification. Munitions that cannot be positively identified by lot number are automatically classified as unserviceable. Exceptions may be made based on the type, quantity, and condition of the munitions and METT-TC.

9-89. Safety precautions and principles that apply to storage of serviceable munitions also apply to storage of unserviceable munitions. Proper records must be kept on all unserviceable items stored at a supply facility.

9-90. Munitions that require maintenance must be segregated and marked to prevent issue. While minor preservation and packaging are performed at field locations, extensive maintenance is usually performed at a depot storage facility.

9-91. The unit performs the packaging and preservation functions if that is all that is required (see Chapter 10). Time permitting, reparable unserviceable munitions are retrograded for repair.

9-92. Munitions abandoned by using units are treated as unserviceable until inspected. The procedures that apply to unit turn-ins also apply to abandoned munitions. Unserviceable munitions are reported through proper channels for disposition instructions. Unserviceable munitions must be disposed of as quickly as possible to preclude further deterioration and potentially unsafe conditions. DA Pam 738-750 provides guidance in requesting disposition of unserviceable munitions. Hazardous unserviceable munitions are reported immediately through proper channels to EOD detachments for destruction. A demolition area is designated and cleared for the safe destruction of munitions.

SUSPENDED AMMUNITION STORAGE

9-93. Specific lots of munitions and components are withdrawn from issue when they are determined to be unsafe or otherwise defective. The problem may be the result of a manufacturing defect, a firing malfunction, or the deterioration of components. Storing munitions by lot number enables the rapid withdrawal from issue of those items that are unsafe, defective, or suspected of being defective.

9-94. The authority to suspend any lot of conventional munitions is vested in the commander, OSC. However, the installation or area commander may place a local suspension on a suspect lot of munitions. A preliminary report and a later detailed report are forwarded through the supporting MMC to theater army headquarters. The munitions remain in local suspension unless higher headquarters changes its status. (See AR 75-1 for instructions for preparing suspension reports. Suspended lots of conventional munitions and

components are listed in TB 9-1300-385. Additional notices of suspensions or restrictions are by QANET updates to ASIS or by other electronic message formats as supplemental changes to TB 9-1300-385.)

9-95. Unless the suspension notice orders it, munitions lots that are stored and later placed under suspension need not be moved to a segregated area. However, stacks of suspended munitions must be clearly marked on all sides using DD Form 1575 and DA Form 3782, or facsimile-formatted documents (taped to the materiel), to show that the items have been suspended or restricted from issue. When foreign nationals are employed, bilingual tags should be produced locally. Suspended or restricted-issue items returned by the firing units, or items received from other supply facilities, must be segregated upon receipt.

CAPTURED ENEMY AMMUNITION STORAGE

9-96. Enemy ammunition is considered excess. IAW AR 381-26, one of three options must be taken when munitions are determined to be excess on the battlefield. These options are use, destroy, or secure and retrograde.

9-97. When an enemy munitions cache is secured for storage, it is first inspected to determine condition, type, and caliber. It is then analyzed and identified by EOD, QASAS/qualified military inspector, and technical intelligence specialists to ensure that it is safe to transport or retrograde to a rear storage area. Items of special interest are noted and quickly reported through intelligence channels. Hazardous enemy munitions must be segregated and disposed of.

9-98. If the cache is retrograded, corps munitions managers are notified to provide QA/QC personnel and transportation assets to support the retrograde operation. These personnel go to the cache to load and transport it to the designated ASA. QA/QC personnel assist in segregating and loading the munitions. The designated ASA places the cache into a designated secure area. CEA must not be stored with US munitions. If possible, it will be stored IBD from all other munitions. Information on the NEW or foreign munitions can be obtained from military intelligence elements. See Chapter 12 of this manual for more information on CEA.

SALVAGE AND PACKAGING STORAGE

9-99. Salvage material includes such items as boxes, crates, and steel containers. Packaging material includes nose plugs, grommets, metal links, clips, cartridge cases, and brass.

9-100. Based on METT-TC, salvage material is normally collected at ASAs and shipped to designated points within the theater of operations for reuse or retrograde. However, if salvage material is turned in at the ATP, the ATP NCO arranges to have it backhauled to an ASA via available transportation. Some salvage material may be used at field facilities to repack serviceable munitions and components. Salvage material is inspected for explosives, recorded on stock records, and reported to the MMC as directed by higher headquarters. The MMC receives disposition and shipping instructions, and gives the instructions to the storage facility based on these reports.

9-101. When inert salvage material is shipped from any munitions facility, the senior inspector must certify the shipment to be free of explosives. Empty chemical containers, boxes, and packaging material must be certified to be free of chemicals or chemical residue.

BINARY CHEMICAL MUNITIONS

9-102. When BCMs are deployed to a theater of operations, the theater commander directs their primary storage location. In wartime, effective measures must be implemented to maintain strict control and safe handling of BCMs. When in-transit, the nonlethal-component canisters are stored separately until higher headquarters gives the release order. Separate storage is imperative for the safety of personnel and facilities. Also, it prevents the possibility of a lethal accident or incident that the enemy could consider as first use.

9-103. BCMs must not be assembled until higher headquarters gives a properly authenticated release order. From the CSA, BCM components are *normally* shipped forward for assembly at the ASP. Depending on the tactical situation, the assembled BCMs are uploaded for issue at the ASP or transported to the ATP for issue. The tactical situation may dictate that the munitions be assembled at the CSA and shipped directly to the ATP. Also, under emergency conditions, unassembled BCMs may be issued directly to the firing unit. Ideally, assembly of BCMs should occur as far forward as possible. This minimizes handling and exposure to possible leaks and contamination. Procedures for storing, shipping, handling, and securing BCMs are discussed below.

Storing and Shipping

9-104. Storage considerations for BCMs apply to both CSA and ASP operations. Commanders of conventional ammunition companies must be prepared to assume custody of BCMs. Normally, the CSA receives BCMs directly from the port and ships these components forward for assembly at the ASP. The commander must ensure that the nonlethal-component canisters are stored in separate structures within the same storage area or in separate locations at different storage areas. Storage of BCMs must be IAW Q-D requirements in DA Pam 385-64. During convoy operations from the port to the CSA, and from the CSA to the ASP, the components are shipped on separate vehicles within the same convoy.

9-105. Upon receipt of an authenticated release order, units generally pick up their allocated BCMs at the same time they replenish their conventional munitions. If the tactical situation changes and uploaded or issued BCMs are no longer required, the units must return the BCMs to the supporting ASA. Munitions specialists disassemble the BCMs and place the component parts in their original packages. The components are then returned to a secure storage location. If there is any uncertainty about the disposition of BCMs, instructions must be requested from higher headquarters.

Handling

9-106. The fewest number of personnel possible must handle BCMs. Commanders must ensure that their units establish SOPs that provide

special handling procedures for BCMs. These procedures must emphasize safety and, at a minimum, must include the following:

- Chain of custody.
- Required MOPP gear.
- Required chemical detector kits and alarms.
- Emergency procedures and assistance for accidents and incidents.
- Monitoring and surveillance requirements.
- Inspection requirements for BCMs and related chemical operations.
- Disassembly procedures for assembled BCMs.
- Specific area for assembly and disassembly operations.

9-107. When handling unitary munitions (e.g., CEA), the conventional ammunition unit takes all necessary NBC precautions, especially if there has been an accident. These precautions include dressing in MOPP-4 gear and requesting EOD and chemical unit support from corps headquarters. See FM 9-20 for more information.

Securing

9-108. Generally, physical security principles that apply during peacetime apply during wartime. However, in emergency situations or intense combat conditions some peacetime requirements may have to be waived. Regardless of the degree of combat, commanders must ensure that qualified personnel provide physical security whenever and wherever chemical munitions are handled. From the time BCMs enter the theater, commanders are responsible for their security during handling, moving, and storage operations. Security personnel may include a combination of escort personnel, MPs, conventional ammunition personnel, and designated personnel from the combat user. Security personnel have the primary mission of preventing unauthorized or uncontrolled access to chemical munitions. Unit commanders must develop a detailed unit SOP that deals with the security of these munitions while in their custody. At a minimum, the SOP will include the following:

- Personnel qualifications for those guarding and having access to chemical munitions.
- Identification of authorized personnel.
- Security during transport of munitions. Details for security planning for chemical munitions are given in AR 50-6, AR 190-11, AR 190-14, AR 190-59, AR 380-67, and FM 19-30.

REWAREHOUSING MUNITIONS

9-109. Rewarehousing is the art of using available space efficiently to support receipt, storage, and issue of munitions with a minimum amount of handling. Space layout planning is one of the most important elements of rewarehousing. Consolidation, location, control, and conservation of storage space are key to good rewarehousing.

NIGHT OPERATIONS

9-110. During combat, ammunition units must be able to perform night operations. With the added disadvantage of darkness, safety must be

paramount in the completion of all issues, turn-ins, receipts, retrograde operations, and shipments. Factors and considerations that affect night operations include the following:

- Soldiers work slower in darkness. Allow more time than usual during night operations.
- A larger work force is necessary for night operations.
- Emphasis on accountability increases. Ensure that soldiers serving as checkers are familiar with the area layout and the locations of the stocks.
- Safety must be stressed to all individuals involved, especially MHE operators. Additional ground guides are needed for night operations.
- Based on the tactical situation, commanders must decide how much light discipline must be maintained. Ensure that proper batteries and blackout filters are available for lights.
- Use night-vision goggles as much as possible. Ensure that proper maintenance is performed to keep them operational.

SUMMARY

9-111. This chapter focuses on storage of munitions in combat/SASO environments. In the future, it is likely that munitions units will be deployed consistently for SASO where field storage conditions are prevalent. If deployed into a combat environment, a unit's storage requirements and considerations will be consistent with those identified in this chapter. Units that support either SASO or combat operations from a CONUS installation should consult DA Pam 385-64 for peacetime and wartime requirements.